1.4 Season 1 Episode 4, 10/11/2015

1. [MPG 2015] Let x and y be real numbers such that

$$2 < \frac{x-y}{x+y} < 5.$$

   Determine all the possible integer values x/y can take.

2. [HMMT 2010] In a group of people, there are 13 who like apples, 9 who like blueberries, 15 who like cantaloupe, and 6 who like dates. (A person can like more than 1 kind of fruit.) Each person who likes blueberries also likes exactly one of apples and cantaloupe. Each person who likes cantaloupe also likes exactly one of blueberries and dates. Find the minimum possible number of people in the group.

3. What are the limitations of Venn diagrams?

4. [China 2015] A 4-digit number *abcd* is a *P-type* number if $a > b$, $b < c$, and $c > d$. Let $N(P)$ denote the number of P-type numbers. A 4-digit number *abcd* is a *Q-type* number if $a < b$, $b > c$, and $c < d$. Let $N(Q)$ denote the number of Q-type numbers. Compute $|N(P) - N(Q)|$.

5. [USAMO 2004, by Ricky Liu] For what real values of $k > 0$ is it possible to dissect a $1 \times k$ rectangle into two similar, but incongruent, polygons?